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Re: Evaluation of Human Health Risks/PCB Cleanup Levels at Waukegan Harbor

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To: Kevin Adler
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I prepared a risk assessment for Waukegan Harbor in 2003 and demonstrated that PCB levels in harbor–caught fish would result in unacceptable human health risks to high-end consumers. More recently, EPA's contractor CH2M Hill prepared a 2006 report entitled "*Risk Evaluation for Development of a PCB Cleanup Level - Waukegan Area of Concern*" which permitted a more updated risk assessment for the harbor. The following are my basic conclusions:

- Cancer and non-cancer risks were derived from the 2006 report which used the following exposure parameters:

  (1) Reasonable maximum exposure (RME) for a high-end fish consumer of 95 one-half-pound fish meals per year (59g/day);
  (2) 50 percent of high-end fish consumer meals come from the harbor;
  (3) 50 percent reduction in PCBs from cleaning and cooking the fish;
  (4) Consumption of 75 percent sport fish and 25 percent bottom feeders; and,
  (5) PCB data set from 2001-2005 which gives a 1.08 ppm PCB weighted average in fish consumed.

- PCB exposures were only considered for adults; however, children or infants reasonably should be considered as well.

- Use of the 2003-2005 data subset in the 2006 report is not appropriate because the number and size/weight of bottom feeders is greatly different from data collected in previous years.

- Resultant excess lifetime cancer risk (ELCR) of 2.0E-4 and a non-cancer Hazard Index (HI) quotient of 11.4 were found for adult high-end consumers using EPA's RfD for PCBs of 2.0E-5. Based on the HI value of 11.4, such risk to adults is more than an order of magnitude greater than acceptable levels and indicate potential immune, reproductive, and cognitive risks.

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- The HI value for infants and children, based upon methodology used for the Fox River RI/FS, was found to be **2.5 times** higher than the adult value or **28.5**.

- The 2006 evaluation determined that the PCB surface weighted average concentration (SWAC) for harbor sediments was 2.16 ppm. To achieve a cancer risk of 1.0E-4, the sediment target cleanup level should be 1.1 ppm PCB SWAC. A sediment target cleanup PCB SWAC of 0.11 ppm would be needed for a 1.0E-5 risk. (See table 3-7 in the 2006 report for derived values.)

- To achieve a Hazard Index of 1.0, based only upon adult exposure, the target sediment cleanup value would be 0.19 ppm PCB SWAC, using the assumptions outlined above. It should be noted that a 0.2-0.25 ppm PCB SWAC cleanup target level has been proposed by EPA. Target cleanup levels would be as low as 0.08 ppm PCB SWAC if children and infant exposures are considered. (Please note that there appears to be an error in the calculations in the 2006 report in which a value of 0.32 ppm PCB SWAC is listed in table 3-7 rather than the 0.19 ppm PCB SWAC derived from the above assumptions. It is recommended that CH2M Hill confirm their calculations and update the document.)

The following are the calculations for the adult high-end consumer:

$$\text{Dose} = \frac{1.08 \text{ mg PCB /kg-fish} \times 0.50 \text{ cleaning/cooking loss} \times 0.059 \text{ kg-fish/day} \times 0.50 \text{ harbor}}{70 \text{ kg-adult body weight}}$$

Dose = 2.27E-4 mg PCB/kg-bw-day

$$\text{HI} = \frac{2.27\text{E-}4 \text{ mg/kg-bw-day}}{2.0\text{E-}5 \text{ mg/kg-bw-day RfD}}$$

HI = 11.4 (adults only)

The post-cleanup target level of 0.19 ppm PCB SWAC is derived by dividing the current sediment PCB SWAC of 2.16 ppm by 11.4 to achieve a final HI of 1.0.

Cancer Risk = Dose of 2.27E-4 mg PCB/kg-bw-day x (30 year exposure/70 years lifetime) x Cancer potency factor of 2.0 $(\text{mg/kg-bw-day})^{-1}$

= 1.95E-4 (2.0E-4)

The post-cleanup target levels of 1.11 ppm PCB SWAC for 1.0E-4 risk and 0.11 ppm PCB SWAC for 1.0E-5 risk are derived by dividing the current sediment PCB SWAC of 2.16 ppm by 2.0E-4.

- To derive cancer and non-cancer risks from the 2006 report for recreational anglers, the following exposure parameters were used:

  (1) 100 percent consumption of sport fish;
  (2) PCB data set from 2001-2005 which gives a 0.30 ppm PCB weighted average in fish consumed by a recreational angler;
  (3) RME for a recreational angler of 95 one-half-pound fish meals per year (59g/day);
  (4) 50 percent of fish meals come from the harbor; and
  (5) 50 percent reduction in PCBs from cleaning and cooking the fish.

- PCB exposures were only considered for adults; however, children or infants reasonably should be considered as well.

- An ELCR of 5.6E-5 and a non-cancer Hazard Index (HI) quotient of 3.2 were calculated for adult recreational anglers using EPA's RfD for PCBs of 2.0E-5. The HI value of 3.2 is greater than acceptable levels.

- The HI value for infants and children, based upon methodology used for the Fox River RI/FS, was found to be 2.5 times higher than the adult value or 8.0.